age children's growth, cognitive and physical function

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Thrasher Research Fund Medical research grants to improve the lives of children





immana

Innovative Methods and Metrics for Agriculture and Nutrition Actions

> National Institutes of Health

Overview

Introduction: Life course, SHINE trial

Methods: SAHARAN toolbox

Results: Growth, physical & cognitive function

Future plans: IMMANA metrics



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The Life Course Approach: 250 million children 'failing to thrive'



Child Health for All, 6th Ed, Saloonje, Piper et al.

Height and body-mass index trajectories of school-aged children and adolescents from 1985 to 2019 in 200 countries and territories: a pooled analysis of 2181 population-based studies with 65 million participants, NCD Risk Factor 3 Collaboration, Lancet Nov 2020

SHINE: independent and combined effects of IYCF and WASH in Zimbabwe

15% children born to HIV-positive mothers "HIV-exposed uninfected" (CHEU)





4 to 6+ visits / day [620 visits]

1000 HIV unexposed (CHUU) = 250 in each arm → detect a difference of 0.2 SD for the intervention

300 CHEU

→ Detect a difference of 0.2 SD c.f. CHUU (0.35 SD for intervention on CHEU)

3. SAHARAN Development: The school-aged health, activity, resilience, anthropometry and neurocognitive assessment toolbox



Caregiver Questionnaire

- Demographics
- SES
- Child adversity
- CPRS (nurture)
- EPDS (maternal depression)
- Food insecurity (HFIAS, HDDS & H-FOOD)
- Water insecurity (H-WISE, H-WATER, access)
- MICS Child discipline
- Gender norms & social support
- HIV counselling & testing

Piper et al. Characterising school-age health and function in rural Zimbabwe using the SAHARAN toolbox, (PloS One under review)



Body composition: Bioimpedance analysis (BIA)

321 girls, 298 boys Age 7 years, 160 CHEU

Quality of Growth BIA (Lean mass index) Skinfolds, Knee-heel length Anthropometry



Preliminary data: please do not shar



Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. Ruiz et al. Br J Sports Med, 45, 518-24 (2011)

4.3 Cognitive function

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Executive function Plus-EF Academic Literacy Numeracy

Cognitive

function

KABC-II

Socioemotional SDQ

> Functional screening WG

Fine motor Finger tapping

munary data: please do not share







Piper et al. Adaptation of the Kaufman Assessment Battery for Children—2nd edition (KABC-II) to assess school-age neurodevelopment in rural Zimbabwe (manuscript in preparation)



Innovative Methods and Metrics for Agriculture and Nutrition Actions



3. Improved cognitive development,

1.

2.

3.

4.

5.

1.

2.

4. Reduced NCD risk, stunting & anaemia

Accelerate progress towards SDGs



Metrics' uptake Longer term 5 years

Research teams, ANH, Ag2Nut, UNICEF, WFP, Gates Foundation, relief agencies, NGO's, Ministries, policy makers, ENN

Grant objectives

- Develop **SAHARAN toolbox** to holisticially measure school-age growth, physical and cognitive function
- Develop COG-SAHARAN metric for school-age cognition
- Develop GROW- SAHARAN metric for school-age health
- Explore potential of combined SUB-SAHARAN metric
- *Operationalise* metrics within the SHINE cohort to see impact of early-life interventions



- 1. SAHARAN TOOLBOX: Paradigm shift to include multiple dimensions of school-age growth & function
- 2. COG- SAHARAN, GROW-SAHARAN METRICS
- 3. Apply among 1000 households in rural Zimbabwe:
 - Unique databank of school-aged growth, NCD-risk, physical & cognitive function
 - Novel factor and reliability analysis suggesting key exposures that determine child cognitive function & health
- 4. **Uptake, transferability & engagement**: learning labs, webinars, commentaries, open-source toolbox, online film

Summary

SAHARAN Toolbox

- Body composition, growth and physical function:
- Strong link of function to growth
 - LMI, birthweight, LAZ at 18 months for physical function
 - HAZ for physical & cognitive function
- Future
- Field-ready Metrics
- Impact of SHINE nutrition & WASH interventions
- Early-life associations e.g. HIV-exposure
- Contemporary associations & adversity

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- Partners: DHE, PHE, Zimbabwean Ministry of Health and Child Care





i) Broad jump

Physical function Grip strength, broad jump Beep test, Hb, BP, HR



Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. Ruiz et al. Br J Sports Med, 45, 518-24 (2011)

ii) Grip strength

Hogrel, JY., Decostre, V., Alberti, C. *et al.* Stature is an essential predictor of muscle strength in children. *BMC Musculoskelet Disord* **13**, 176 (2012)

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strength /

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Field-based fitness assessment in young people: the ALPHA health-related fitness test battery for children and adolescents. Ruiz et al. Br J Sports Med, 45, 518-24 (2011)

Skinfold thickness: measures fat mass



Eur J Clin Nutr. 2012 May;66(5):613-21. Preliminary data: please do not share 21 Percentile curves for skinfold thickness in 7- to 14-year-old children and adolescents from Jena, Germany

